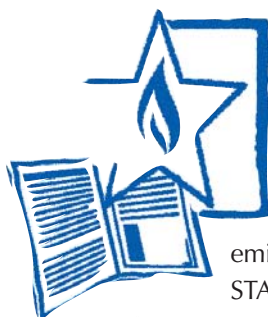


NATURAL GAS STAR



PARTNER UPDATE

Gas STAR Partners Exceed Emissions Reduction Target by 23%



2002 was another strong year for the Natural Gas STAR Program, with partners reporting record emissions reductions. Gas STAR Partners reported

methane emissions reductions of 51 billion cubic feet (Bcf) in 2002 — an increase of 8 Bcf over 2001 and 14 Bcf over 2000. This increase was a result of the aggressive implementation of best management practices (BMPs) and partner reported opportunities (PROs). Total cumulative reductions by Gas STAR Partners since 1990 now add up to more than 275 Bcf — the greenhouse gas equivalent of planting over 33,000 acres of trees or removing over 24 million cars from the road for one year.

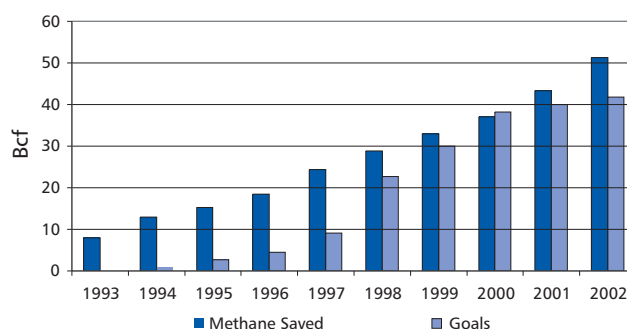
Distribution partners accounted for the greatest increase — from 1.4 Bcf in 2001 to over 8 Bcf in 2002. The relatively new (started in 2000) Processing Sector increased their reporting from 665 million cubic feet (Mmcf) to 850 Mmcf. Production partners increased their reporting from 23.7 Bcf to 24.9 Bcf, and transmission partners reports held steady at 17.5 Bcf.

As has been the case for the last few years, most of the reductions are now attributable to PROs. Top PROs for the Production

Sector include vapor recovery units (VRUs), flares, plunger lifts, electric pumps, and instrument air systems. Processing Sector partners reported reductions from installing larger wet stabilizer reboilers, modifying compressor shutdown logic, and using condensate vapors for fuel use. The Transmission Sector, leading the way with over 10

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Natural Gas STAR Methane Emissions Progress and Goals



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Lessons Learned: Spotlight on Three New Technologies

The Natural Gas STAR Program, in cooperation with the natural gas industry, has developed a series of new *Lessons Learned* studies highlighting technologies and practices companies can use to cost-effectively reduce their methane emissions. In this *Partner Update*, we highlight three technologies: Composite Wrap, Plunger Lifts and Desiccant Dehydrators. All three detailed *Lessons Learned* studies will soon be available on the Gas STAR Web site at <http://www.epa.gov/gasstar/lessons.htm>.

Composite Wrap

The composite wrap technology is a permanent, cost-effective pipeline repair technology, suitable for non-leaking defects such as pits, dents,

gouges, and external corrosion. Composite wrap can be performed on an operating pipeline without taking it out of service. This repair technique is quick and generally less costly than other repair options, and it permanently restores the pressure-containing capability of the pipe when properly installed.

Composite wrap can serve as an alternative to the traditional pipeline repair practices such as pipeline replacement or the installation of full-encirclement steel split sleeves. Composite wrap repairs are generally less expensive, time consuming, and labor intensive than other technologies. In the case of pipeline replacement, composite wrap repair eliminates methane emissions

associated with the venting of the damaged pipeline.

Using composite wrap as an alternative to pipeline replacement is often sufficient to pay back repair costs immediately. One Natural Gas STAR partner reported completing up to 65 composite wrap repairs per year on pipelines 10" and larger, saving 526 thousand cubic feet (Mcf) to 27,500 Mcf of methane per repair, totaling over 106,133 Mcf in saved methane.

Some of the benefits of composite wrap are:

- Methane savings as composite wrap eliminates the need to shut-down damaged pipeline and vent methane to the atmosphere prior to repair.
- Composite wrap may be an ideal choice for non-leaking defects when repair is urgently required and no back-up gas supply is available.
- Composite wrap eliminates costly delays for specifying and procuring metal sleeves or pipe segments to repair the pipeline.
- Composite wrap repairs can be done without disrupting the continuity of the cathodic protection system.

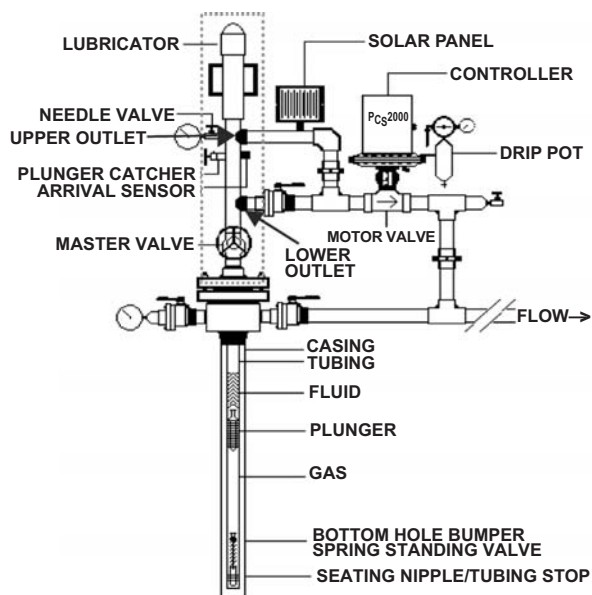


1. A high strength glass fiber composite or laminate
2. An adhesive or resin bonding system
3. A high-compressive-strength load transfer filler compound

Source: Clock Spring® Company L.P.

Plunger Lift

In mature gas wells, the accumulation of fluids in the wellbore can impede and, in some cases, halt gas production. To keep gas flowing, accumu-



Source: Adapted from Production Services Control, Inc.
www.pscplungerlift.com/plungerlift.html

Plunger Lift

lated fluids are commonly removed through the use of a beam pump or remedial treatments, such as swabbing, soaping, or venting the well to atmospheric pressure (referred to as "blowing down" the well). Fluid removal operations, particularly well blowdowns, may result in substantial methane emissions to the atmosphere.

Installing a plunger lift system is a cost-effective alternative for removing liquids, and has the additional benefit of increasing production and significantly reducing methane emissions associated with blowdown. A plunger lift uses the well's latent pressure energy to more efficiently lift the accumulated fluid column out of the well. By removing gas well liquids, the plunger lift system helps

to maintain production levels and eliminates the need for traditional remedial treatments.

Natural Gas STAR Partners have reported significant economic benefits and methane emission reductions from installing plunger lift systems in

gas wells. Companies have reported annual gas savings averaging 600 thousand cubic feet (Mcf) per well by avoiding blowdowns. In addition, increased gas production following plunger lift installation has yielded total annual gas benefits of up to 18,250 Mcf per well, worth an estimated \$54,750. Benefits from both increased gas production and emissions savings are well-and-reservoir-specific and will vary considerably.

Desiccant Dehydrators

There are approximately 30,000 high-pressure, on-shore gas wells producing 4 trillion cubic feet of natural gas annually in the United States. About 700 of these wells have conventional glycol dehydrators, emitting an estimated 1 billion cubic feet (Bcf) per year of methane to the atmosphere. Glycol dehydrators vent methane, volatile organic compounds (VOCs), and hazardous air pollutants (HAPs) to the atmosphere from the glycol regenerator and also bleed

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ANNOUNCEMENTS:

10th ANNUAL IMPLEMENTATION WORKSHOP

The 10th Annual Natural Gas STAR Implementation Workshop is scheduled to take place in Houston, TX from October 27-29, 2003. The agenda and online registration for the workshop can be found by visiting <http://www.epa.gov/gasstar/workshoppast.htm>.

INTERNATIONAL METHANE & NITROUS OXIDE MITIGATION CONFERENCE IN NOVEMBER

The 3rd International Methane & Nitrous Oxide Mitigation Conference is scheduled for November 17-21, 2003 in Beijing, China. For more details on the conference, visit http://www.ergweb.com/methane_china/index.htm

Emerging Technology: Optical Imaging Leak Detection.....

Optical imaging is an innovative technology that creates a visual image of a leak, in real time by using the principles of infrared light and optics. The creation of a visual image facilitates rapid leak identification and reduces associated labor costs.

Currently, there are two optical imaging technologies under development: backscatter absorption gas imaging (BAGI) and image multi-spectral sensing (IMSS.) While BAGI and IMSS both create a visual

image of a leak in real time, there are differences between the two.

BAGI illuminates the facilities with laser light tuned to the frequency absorbed by the hydrocarbon (or chemical) that could be leaking. The laser light reflects off the equipment, and back to the camera the same way that a flash bulb illuminates a dark scene with visible light for photography. The BAGI camera creates a black and white image of the scene illuminated by the laser light (which is in the infrared light wavelength). If gas is leaking, the cloud in the air absorbs the laser light, and thereby appears black (absence of light reflected back to the camera).

There are two types of BAGI technology, one based on a carbon dioxide laser that is commercially available but can not image methane. The second BAGI technology uses a "tunable" laser that can image all hydrocarbon species including methane, and is planned to be commercially available in 2004.

IMSS takes a picture of equipment using special lenses and prisms to separate out the infrared spectra of the gas that is potentially leaking. This image is processed in a computer to create a false-color image of the leaking gas, superimposed on the visible light image of the equipment. Because this technology does not require a laser to illuminate the scene, it can "see" gas leaks against the sky or distant backgrounds,

whereas the laser (BAGI) technology needs a near, reflective background to create a bright image against which a black gas cloud could be seen. The IMSS technology can also image all hydrocarbons, but has not yet advanced to commercialization stage.

Costs for the two technologies have in some cases been established and in other cases have not. The CO₂ laser sells for about \$130,000. A price has not yet been established for either the "tunable" laser BAGI camera or the IMSS camera. More commercial information about either of these technologies may be available from the developers. The "tunable" laser BAGI technology and IMSS technology are currently being considered for use by the petroleum refining and petrochemical industries as an alternative for Method 21 as specified for mandatory VOC control programs. Once commercially available, both of these technologies should be highly cost-effective in screening for leaks of any hydrocarbon gas, including methane.

Improvements have been made to the Natural Gas STAR Web site. Check it out at: www.epa.gov/gasstar

The Natural Gas STAR Program has created two new documents. Copies of these documents will soon be available on the Gas STAR Web site:

The Natural Gas STAR Program — Reducing Methane Emissions, Increasing Efficiency and Maximizing Profits. This document gives an overview of the Gas STAR Program for new and potential partners.

Hands-on Guide to Implementing the Natural Gas STAR Program — This document gives new and current partners a step-by-step guide for implementing all aspects of the Natural Gas STAR Program.

Tell Us What You Think!

The Natural Gas STAR Program would like to hear what you think about the Partner Updates. Contact EPA's Gas STAR Program to comment on the article topics, timeliness, format of the Updates, and to request any additional information. We appreciate your feedback. Thank you!

Welcome New Partners!.....

Consumers Energy — Consumers Energy is a member-owned electric, natural gas and energy services cooperative. They serve 4,700 members and are based out of Marshalltown, IA. Consumers Energy is also a Touchstone Energy cooperative, which is an alliance of local, member-owned cooperatives serving millions of businesses and homes across the country.

Devon Energy Corporation — Devon Energy Corporation of Oklahoma City,

OK hosted a Natural Gas STAR partnership agreement signing ceremony at Devon headquarters on July 21, 2003. Chairman and CEO, Larry Nichols co-signed with Roger Fernandez, a STAR Program Manager. Employees of Devon and local news media attended the ceremony. Nichols said, "It is possible to meet our nation's energy demands while also being sensitive to environmental concerns. This is an excellent example of government and industry working together to find solutions to

these challenges." Devon Energy Corporation is the largest U.S. based independent oil and gas producer and one of the largest independent processors of natural gas and natural gas liquids in North America.

El Paso Production — El Paso Production Company, headquartered in Houston, TX was the most active driller in the United States during 2002 and owns one of the industry's largest inventories of drilling prospects. El Paso Production operates in three core areas: South Texas, the deep shelf of the Gulf of Mexico, and coalbed methane fields across the United States.

Gulf South Pipeline — Gulf South Pipeline Company, LP with headquarters in Houston, TX, is a wholly owned subsidiary of Entergy-Koch, LP. Gulf South operates nearly 7,000 miles of transmission pipeline, 33 compressor stations and numerous interconnects with other major interstate pipelines serving the Northeast, Midwest, and Southeastern United States.

Puget Sound Energy — Puget Sound Energy headquartered in Seattle, WA,
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Devon Energy Corporation signing ceremony. Pictured left to right: Denise Bode, Chairman, Oklahoma Corporation Commission; Roger Fernandez, Program Manager, Natural Gas STAR Program; Larry Nichols, Chairman and CEO, Devon Energy Corporation

Gas STAR Partners Exceed Emissions Reduction Target

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Bcf in reductions from PROs, reported big gas savings from reducing pipeline pressure prior to pumpdown, replacing wet seals with dry seals, using composite wrap systems for repairing non-leaking defects, and installing VRUs. Some of the most important Distribution

Sector PROs include altering emergency shutdown (ESD) practices, installing excess flow valves, and replacing gas starters with air.

The graph on page 1 shows how the growth in emissions reductions reported in the past two years has

been greater than at any other time in Gas STAR history. In fact, partners' reports have exceeded our Climate Change Action Plan (CCAP) goals for the past two years. All the credit goes to our partners — congratulations, and keep up the good work!

Technology Transfer Workshops – Highlights!.....

The Natural Gas STAR Program co-hosted three technology transfer workshops for producers, processors, and transmission and distribution partners in June. Conference materials and information can be downloaded at: www.epa.gov/gasstar/rtt_worksh.htm.

Processors Workshop

The Gas Processors Association, Pioneer Natural Resources, and EPA's Natural Gas STAR Program sponsored a processor's workshop in Amarillo, TX on June 17, 2003. The workshop addressed various methane leak and fugitive emissions reduction technologies and techniques. Pioneer also hosted a very informative tour of their Fain gas processing plant. Presenters discussed best operating practices, company reported opportunities, and individual experiences from partners.

Information on the following new and emerging technologies was presented:

- Convert gas pneumatic controls to instrument air;
- Composite wrap / pipeline repair;
- Optical imaging of fugitive emissions; and
- Acid gas removal.

Producers Workshop

Murphy Oil, the American Petroleum Institute (API), and Gas STAR hosted a producers workshop at Murphy's headquarters in New Orleans, LA on June 19, 2003. In addition to partners attending the workshop,

representatives from four state government agencies also attended.

A highlight for participants was the opportunity to hear Bob Greco, American Petroleum Institute's (API) Director of Global Climate Programs discuss API's Climate Challenge Program, which includes working toward 100% API member participation in the Natural Gas STAR Program. Presentations also addressed the following new and emerging technologies:

- Plunger lift;
- Reciprocating compressor seals;
- Composite wrap pipeline repair;
- Optical imaging of fugitive emissions; and

Welcome New Partners!

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is Washington State's leading utility. Puget Sound Energy delivers electricity and natural gas to more than 1.2 million customers throughout the state.

Torch Energy — Torch Energy of Houston, TX owns and has interests in oil and gas properties in Texas, Alabama and Louisiana. Torch is also one of the largest managers of energy-related assets in North America, and oversees more than \$250 million in annual operational expenditures.

XTO Energy — XTO Energy of Fort Worth, TX, is one of the nation's fastest growing natural gas and oil producers. XTO has the fourth largest

- Vapor recovery using ejector technology.

Transmission and Distribution Workshop

NiSource and the Natural Gas STAR Program co-hosted the first Program transmission and distribution workshop at NiSource's headquarters in Merrillville, IN on June 3, 2003. Presenters from both NiSource and the Gas STAR Program discussed many topics, including:

- Directed inspection and maintenance at compressor stations;
- Low-cost best operating practices;
- Composite wrap pipeline repair; and
- Low-bleed pneumatics.

position of domestic gas reserves among independents. Since going public in 1993, the Company has increased production and reserves at a compounded annual growth rate of about 30 percent.

Quicksilver Resources — Quicksilver Resources, based in Fort Worth, Texas is a natural gas and crude oil producer. With properties in Michigan, Indiana, the Rocky Mountains and the Canadian province of Alberta, it is widely recognized as a leader in the development and production of unconventional natural gas reserves, including coal bed methane, shale gas, and tight sand gas.

Lessons Learned: Spotlight on Three New Technologies

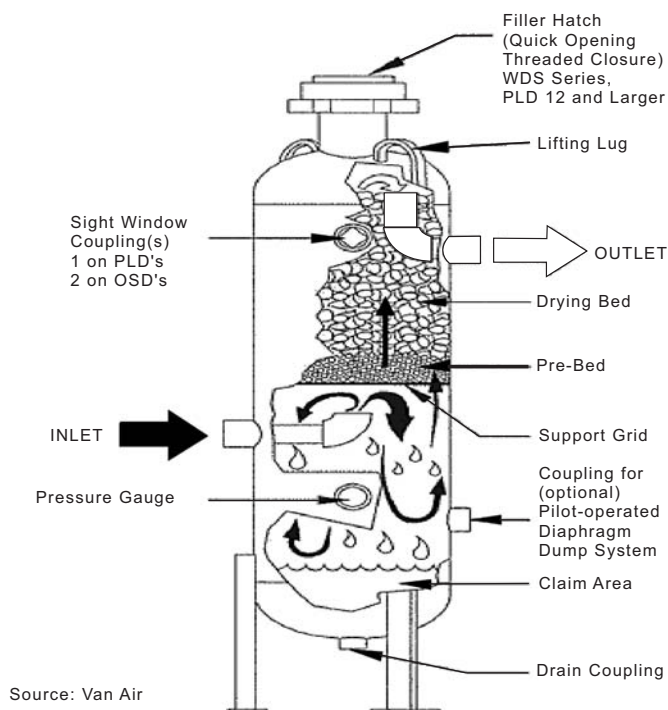
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natural gas from pneumatic control devices. This process wastes gas, costs money, and contributes to local air quality problems as well as global climate change.

Natural Gas STAR Partners have found that replacing these glycol dehydrators with desiccant dehydrators reduces methane, VOC, and HAP emissions by 99 percent and also reduces operating and maintenance costs. In a desiccant dehydrator, wet gas passes through a drying bed of desiccant tablets. The tablets pull moisture from the gas and gradually dissolve in the

process. Since the unit is fully enclosed, gas emissions occur only when the vessel is opened, such as when new desiccant tablets are added.

Economic analyses demonstrate that replacing a glycol dehydrator processing 1 million cubic feet per day (mmcf) of gas with a desiccant dehydrator can save up to approximately \$4,500 per year in fuel gas, vented gas, and operation and maintenance (O&M) costs and reduce methane emissions by 564 thousand cubic feet (mcf) per year.



Schematic of Single Vessel Desiccant Dehydrator

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For additional information on topics in this Update, please contact Roger Fernandez.

New Contact Information for EPA's Natural Gas STAR Program

After October 1, 2003, the Natural Gas STAR contact information will change to the following:

Waiting for new phone and fax numbers.